

This listing of claims will replace all prior versions,  
and listings, of claims in the application:

1 Claim 1 (previously presented): A communication device for  
2 use in a communication's system that uses multiple tones  
3 distributed over a predetermined bandwidth to communicate  
4 data, the device comprising:  
5       a mapping circuit that receives data symbols and  
6 maps the symbols to prescribed time instants in a  
7 predetermined time interval to generate a discrete signal  
8 including mapped symbols, each mapped symbol corresponding  
9 to a discrete point in time; and  
10       an interpolation circuit that receives the  
11 discrete signal and generates a continuous signal by  
12 applying an interpolation function to the discrete signal,  
13 the interpolation function operating on the discrete signal  
14 such that a frequency response of the continuous signal  
15 includes sinusoids having non-zero values at a first set of  
16 tones, the first set of tones being a subset of said  
17 multiple tones, the non-zero value at each of said first  
18 set of tones being a function of a plurality of mapped  
19 symbols corresponding to different discrete points in time,  
20 the frequency response of the continuous signal also  
21 including zero values at a second set of tones, the second  
22 set of tones being different from said first set of tones  
23 and being another subset of said multiple tones.

1 Claim 2 (previously presented): The device of claim 1  
2 wherein the discrete time instants are defined within the  
3 range of  $0, T/N, 2T/N, \dots, T(N-1)/N$ , where  $N$  is a total  
4 number of time instants in the predetermined time interval.

1 Claim 3 (currently amended): The device of claim 1 wherein  
2 the frequency tones within the ~~allocated tone~~ first set of  
3 tones are contiguous frequency tones, and the prescribed  
4 time instants are equally spaced and uniformly distributed  
5 over one symbol duration.

1 Claim 4 (currently amended): The device of claim 1 wherein  
2 the frequency tones within the ~~allocated tone~~ first set of  
3 tones are equally spaced frequency tones, and the  
4 prescribed time instants are equally spaced and uniformly  
5 distributed over a fraction of one symbol duration.

1 Claim 5 (currently amended): The device of claim 4 wherein  
2 a fraction of one symbol duration is defined by  $1/L$  where  $L$   
3 is the spacing between two adjacent ~~allocated frequency~~  
4 tones in the ~~allocated~~ first tone set of tones.

1 Claim 6 (previously presented): The device of claim 1  
2 wherein a total number of discrete time instants is greater  
3 than or equal to a total number of frequency tones  
4 distributed over the predetermined bandwidth.

1 Claim 7 (previously presented): The device of claim 1  
2 wherein the interpolation circuit further includes a memory  
3 for storing the predetermined interpolation functions, and  
4 an interpolation function module for retrieving the  
5 interpolation functions from the memory and applying the  
6 interpolation functions to the discrete signal to generate  
7 the continuous signal.

1 Claim 8 (previously presented): The device of claim 7  
2 wherein the interpolation functions comprise a matrix of  
3 precomputed sinusoidal waveforms.

1 Claim 9 (previously presented): The device of claim 7  
2 wherein the interpolation functions comprise continuous  
3 interpolation functions.

1 Claim 10 (previously presented): The device of claim 1  
2 wherein the mapping circuit replicates the discrete signal  
3 of mapped symbols to generate an infinite series of mapped  
4 symbols over prescribed time instants covering a time  
5 interval from  $-\infty$  to  $+\infty$ .

1 Claim 11 (previously presented): The device of claim 10  
2 wherein the interpolation functions comprise sinc  
3 interpolation functions, and the interpolation circuit  
4 applies the sinc interpolation functions to the infinite  
5 series of mapped symbols.

1 Claim 12 (previously presented): The device of claim 1  
2 wherein the data symbols are complex symbols associated  
3 with a symbol constellation.

1 Claim 13 (previously presented): The device of claim 1  
2 further including a digital signal processor for  
3 implementing the mapping circuit and the interpolation  
4 circuit.

1 Claim 14 (currently amended): The device of claim 1  
2 wherein said interpolation circuit includes a sampling  
3 circuit for sampling the continuous signal to produce a  
4 digital signal sample vector, the device further including  
5 a cyclic prefix circuit for receiving the digital signal  
6 sample vector from the sampling circuit and prepending a  
7 cyclic prefix to the digital signal sample vector.

1 Claim 15 (previously presented): The device of claim 14  
2 wherein the cyclic prefix circuit operates to copy an end  
3 portion of the digital signal sample vector and prepend the  
4 end portion to a beginning portion of the digital signal  
5 sample vector.

1 Claim 16 (currently amended): The device of claim 1,  
2 wherein said interpolation circuit includes a sampling  
3 circuit for sampling the continuous signal to produce a  
4 digital signal sample vector, the device further including  
5 a digital to analog converter operable to receive the  
6 digital signal sample vector and generate an analog signal  
7 for transmission ~~within the communication system.~~

1 Claim 17 (original): A communication system for generating  
2 an OFDM signal having allocated frequency tones distributed  
3 over a predetermined bandwidth, the communication system  
4 comprising:  
5           a mapping module that receives data symbols from  
6 a symbol constellation and maps the symbols to prescribed  
7 time instants in a time domain symbol duration to generate  
8 a discrete signal of mapped symbols; and  
9           an interpolation module that receives the  
10 discrete signal and generates a continuous signal by  
11 applying an interpolation function to the discrete signal;  
12           wherein the interpolation function operates on  
13 the discrete signal such that a frequency response of the  
14 continuous signal includes sinusoids having non-zero values  
15 at the allocated frequency tones, and zero values at  
16 frequency tones other than the allocated frequency tones.

1 Claim 18 (original): The communication system of claim 17  
2 wherein the allocated frequency tones are associated with a  
3 designated transmitter within the communication system.

1 Claim 19 (original): The communication system of claim 17  
2 wherein the allocated frequency tones are contiguous  
3 frequency tones, and the prescribed time instants are  
4 equally spaced time instants uniformly distributed over one  
5 symbol duration.

1 Claim 20 (original): The communication system of claim 17  
2 wherein the allocated frequency tones are equally spaced  
3 frequency tones, and the prescribed time instants are  
4 equally spaced time instants uniformly distributed over a  
5 fraction of one symbol duration.

1 Claim 21 (original): The communication system of claim 20  
2 wherein a fraction of one symbol duration is defined by  $1/L$   
3 where  $L$  is the spacing between two adjacent allocated  
4 frequency tones.

1 Claim 22 (original): The communication system of claim 17  
2 wherein the interpolation function operates on the discrete  
3 signal such that values of the continuous signal at the  
4 prescribed time instants are equal to the mapped symbols.

1 Claim 23 (original): The communication system of claim 17  
2 wherein the interpolation module includes a memory for  
3 storing the interpolation function, the interpolation  
4 module retrieving the interpolation function from the  
5 memory and applying the interpolation function to the  
6 discrete signal to generate the continuous signal.

1 Claim 24 (original): The communication system of claim 23  
2 wherein the interpolation function comprises a sinc  
3 interpolation function.

1 Claim 25 (original): A communication system for generating  
2 an OFDM signal having allocated frequency tones distributed  
3 over a predetermined bandwidth, the communication system  
4 comprising:  
5           a mapping module that receives data symbols from  
6 a symbol constellation and maps the symbols to prescribed  
7 time instants in a time domain symbol duration to generate  
8 a discrete signal of mapped symbols; and  
9           an interpolation module that receives the  
10 discrete signal and generates a digital signal sample  
11 vector by applying an interpolation function to the  
12 discrete signal;  
13           wherein the interpolation function operates on  
14 the discrete signal such that a frequency response of the  
15 digital signal sample vector includes sinusoids having non-  
16 zero values at the allocated frequency tones, and zero  
17 values at frequency tones other than the allocated  
18 frequency tones.

1 Claim 26 (original): The communication system of claim 25  
2 wherein the interpolation module further includes a memory  
3 for storing the interpolation function, the interpolation  
4 module retrieving the interpolation function from the  
5 memory and applying the interpolation function to the  
6 discrete signal to generate a digital signal sample vector.

1 Claim 27 (original): The communication system of claim 26  
2 wherein the interpolation function is a discrete

3 interpolation function comprising a matrix of precomputed  
4 sinusoidal waveforms.

1 Claim 28 (original): The communication system of claim 27  
2 wherein the interpolation module multiplies the matrix of  
3 precomputed sinusoidal waveforms with the discrete signal  
4 of mapped symbols over the time domain symbol duration to  
5 generate the digital signal sample vector.

1 Claim 29 (original): A communication system for generating  
2 an OFDM signal having allocated frequency tones distributed  
3 over a predetermined bandwidth, the communication system  
4 comprising:  
5           a mapping module that receives data symbols from  
6 a symbol constellation and maps the symbols to prescribed  
7 time instants in a time domain symbol duration to generate  
8 a discrete signal of mapped symbols; and  
9           an interpolation module that receives the  
10 discrete signal and generates a continuous signal by  
11 applying an interpolation function to the discrete signal;  
12           wherein the interpolation function operates on  
13 the discrete signal such that values of the continuous  
14 signal at the prescribed time instants are equal to the  
15 mapped symbols.

1 Claim 30 (original): A communication system comprising:  
2           a mapping circuit that receives data symbols and  
3 maps the symbols to prescribed time instants in a time  
4 domain symbol duration to generate a discrete signal of  
5 mapped symbols; and  
6           an interpolation circuit that receives the  
7 discrete signal and generates a continuous signal by  
8 applying an interpolation function that operates on the

9 discrete signal such that a frequency response of the  
10 continuous signal includes sinusoids having non-zero values  
11 at a first set of tones, and zero values at a second set of  
12 tones.

1 Claim 31 (currently amended): The communication system of  
2 claim ± 30 wherein the continuous signal comprises an OFDM  
3 communication signal and wherein the value of the  
4 continuous signal at each of the prescribed time instants  
5 is a function of the mapped symbol at said prescribed time  
6 instant.

1 Claim 32 (original): The communication system of claim 30  
2 wherein the first set of tones are allocated to one  
3 communication device within the communication system.

1 Claim 33 (original): The communication system of claim 32  
2 wherein the communication device comprises a transmitter.

1 Claim 34 (original): The communication system of claim 30  
2 wherein the interpolation circuit is adapted to store the  
3 interpolation function.

1 Claim 35 (original): The communication system of claim 34  
2 wherein the interpolation function is a sinc interpolation  
3 function.

1 Claim 36 (original): The communication system of claim 34  
2 wherein the interpolation function is a matrix of  
3 precomputed sinusoidal waveforms.

1 Claim 37 (original): The communication system of claim 36  
2 wherein the interpolation circuit multiplies the matrix of



3 precomputed sinusoidal waveforms with the discrete signal  
4 of mapped symbols over the time domain symbol duration to  
5 generate the continuous signal.

1 Claim 38 (original): The communication system of claim 30  
2 further comprising a sampling circuit that samples the  
3 continuous signal at discrete time instants distributed  
4 over the time domain symbol duration to generate a digital  
5 signal sample vector.

1 Claim 39 (original): The communication system of claim 38  
2 wherein the discrete time instants are defined within the  
3 range of  $0, T/N, 2T/N, \dots, T(N-1)/N$ , where  $N$  is a total  
4 number of time instants in the time domain symbol duration.

1 Claim 40 (original): The communication system of claim 30  
2 wherein the data symbols are complex symbols associated  
3 with a symbol constellation.

1 Claim 41 (original): A communication system comprising:  
2           a mapping circuit that receives data symbols and  
3 maps the symbols to prescribed time instants in a time  
4 domain symbol duration to generate a discrete signal of  
5 mapped symbols; and  
6           an interpolation circuit that receives the  
7 discrete signal and generates a digital signal sample  
8 vector by applying an interpolation function that operates  
9 on the discrete signal such that a frequency response of  
10 the digital signal sample vector includes sinusoids having  
11 non-zero values at a first set of tones, and zero values at  
12 a second set of tones.

1 Claim 42 (original): The communication system of claim 41  
2 wherein the interpolation circuit is adapted to store the  
3 interpolation function.

1 Claim 43 (original): The communication system of claim 42  
2 wherein the interpolation function is a matrix of  
3 precomputed sinusoidal waveforms.

1 Claim 44 (original): The communication system of claim 43  
2 wherein the interpolation circuit multiplies the matrix of  
3 precomputed sinusoidal waveforms with the discrete signal  
4 of mapped symbols over the time domain symbol duration to  
5 generate the digital signal sample vector.

Claims 45-49 (canceled)

1 Claim 50 (original): A method for reducing a peak-to-  
2 average ratio in an OFDM communication signal transmitted  
3 by a communication device, the method comprising:  
4           providing a time domain symbol duration having  
5 equally spaced time instants;  
6           allocating a predetermined number of frequency  
7 tones to the communication device;  
8           receiving as input data symbols to be transmitted  
9 by the OFDM communication signal;  
10           mapping the data symbols to the equally spaced  
11 time instants in the symbol duration to generate a discrete  
12 signal of mapped symbols;  
13           generating a continuous signal by applying an  
14 interpolation function to the discrete signal, the  
15 interpolation function operating on the discrete signal  
16 such that a frequency response of the continuous signal  
17 includes sinusoids having non-zero values at the allocated

18 frequency tones, and zero values at frequency tones other  
19 than the allocated frequency tones; and  
20 sampling the continuous signal at discrete time  
21 instants distributed over the time domain symbol duration,  
22 to generate a digital signal sample vector.

1 Claim 51 (original): The method of claim 50 wherein the  
2 discrete time instants are defined within the range of 0,  
3  $T/N$ ,  $2T/N$ , ...,  $T(N-1)/N$ , where  $N$  is a total number of time  
4 instants in the symbol duration.

1 Claim 52 (original): The method of claim 50 wherein the  
2 step of allocating a predetermined number of frequency  
3 tones to the communication device further comprises  
4 allocating contiguous frequency tones to the communication  
5 device.

1 Claim 53 (original): The method of claim 50 wherein the  
2 step of allocating a predetermined number of frequency  
3 tones to the communication device further comprises  
4 allocating equally spaced frequency tones to the  
5 communication device.

1 Claim 54 (original): The method of claim 50 further  
2 including the step of replicating the mapped symbols within  
3 the symbol duration to generate an infinite series of data  
4 symbols over equally spaced time instants covering a time  
5 interval from  $-\infty$  to  $+\infty$  after the step of mapping the data  
6 symbols.

1 Claim 55 (original): The method of claim 54 wherein the  
2 step of generating the continuous signal further comprises

3 applying a sinc interpolation function to the infinite  
4 series of data symbols.

1 Claim 56 (original): The method of claim 50 wherein the  
2 discrete signal of mapped symbols includes odd numbered  
3 symbols and even number symbols, and further comprises the  
4 step of phase rotating each even numbered symbol by  $\pi/4$ .

1 Claim 57 (original): The method of claim 50 further  
2 comprising the step of mapping the data symbols to a block  
3 of complex data symbols wherein the block of complex data  
4 symbols includes odd numbered symbols and even numbered  
5 symbols;  
6 phase rotating each even numbered symbol by  $\pi/4$ ;  
7 and  
8 mapping the block of complex data symbols to  
9 equally spaced time instants in the symbol duration to  
10 generate the discrete signal of mapped symbols.

1 Claim 58 (original): The method of claim 50 further  
2 comprising the step of offsetting imaginary components of  
3 the digital signal sample vector by a predetermined number  
4 of samples for producing a cyclic offset in the digital  
5 signal sample vector.

1 Claim 59 (original): The method of claim 58 further  
2 comprising the step of fixing a position of real components  
3 of the digital signal sample vector with respect to the  
4 imaginary components.

1 Claim 60 (original): The method of claim 58 wherein the  
2 predetermined number of samples is an integer number of  
3 samples.

1 Claim 61 (original): The method of claim 58 wherein the  
2 predetermined number of samples is a fraction of one sample  
3 period.

1 Claim 62 (original): The method of claim 50 further  
2 comprising the step of prepending a cyclic prefix to the  
3 digital signal sample vector.

1 Claim 63 (original): The method of claim 62 wherein the  
2 step of prepending a cyclic prefix further comprises  
3 copying an end portion of the digital signal sample vector  
4 and prepending the end portion to a beginning portion of  
5 the digital signal sample vector.

1 Claim 64 (original): The method of claim 50 wherein the  
2 step of allocating a predetermined number of frequency  
3 tones includes allocating more tones than a total number of  
4 data symbols to be transmitted in the symbol duration.

1 Claim 65 (original): The method of claim 50 wherein the  
2 interpolation function is a raised cosine function.

1 Claim 66 (original): The method of claim 50 further  
2 comprising the step of precomputing the interpolation  
3 function and storing the interpolation function in a  
4 memory.

1 Claim 67 (original): A method for reducing a peak-to-  
2 average ratio in an OFDM communication signal having a set  
3 of tones distributed over a predetermined bandwidth, the  
4 method comprising:  
5           defining a symbol duration for the OFDM  
6 communication signal;

7           defining time instants in the symbol duration;  
8           allocating frequency tones from the set of tones  
9   to a particular communication device;  
10          receiving as input data symbols from a symbol  
11   constellation, the data symbols being transmitted by the  
12   OFDM communication signal;  
13          mapping the data symbols to the time instants to  
14   generate a discrete signal in the time domain;  
15          generating a digital signal sample vector by  
16   applying interpolation functions to the discrete signal  
17   such that a frequency response of the digital signal sample  
18   vector includes sinusoids having non-zero values at  
19   allocated frequency tones, and zero values at frequency  
20   tones other than the allocated frequency tones.

1   Claim 68 (original): The method of claim 67 wherein the  
2   step of allocating frequency tones further includes  
3   allocating contiguous tones, and mapping the data symbols  
4   to equally spaced time instants distributed over one symbol  
5   duration.

1   Claim 69 (original): The method of claim 67 wherein the  
2   step of allocating frequency tones further includes  
3   allocating equally spaced tones, and mapping the data  
4   symbols to equally spaced time instants distributed over a  
5   portion of one symbol duration.

1   Claim 70 (original): The method of claim 67 wherein the  
2   data symbols are complex symbols.

1   Claim 71 (original): The method of claim 67 wherein the  
2   discrete signal includes odd numbered symbols and even

3 number symbols, and further comprises the step of phase  
4 rotating each even numbered symbol by  $\pi/4$ .

1 Claim 72 (original): The method of claim 67 further  
2 comprising the step of mapping the data symbols to a block  
3 of complex data symbols wherein the block of complex data  
4 symbols includes odd numbered symbols and even numbered  
5 symbols;  
6 phase rotating each even numbered symbol by  $\pi/4$ ;  
7 and  
8 mapping the block of complex data symbols to  
9 equally spaced time instants in the symbol duration to  
10 generate the discrete signal.

1 Claim 73 (original): The method of claim 67 further  
2 comprising the step of offsetting imaginary components of  
3 the digital signal sample vector by a predetermined number  
4 of samples for producing a cyclic offset in the digital  
5 signal sample vector.